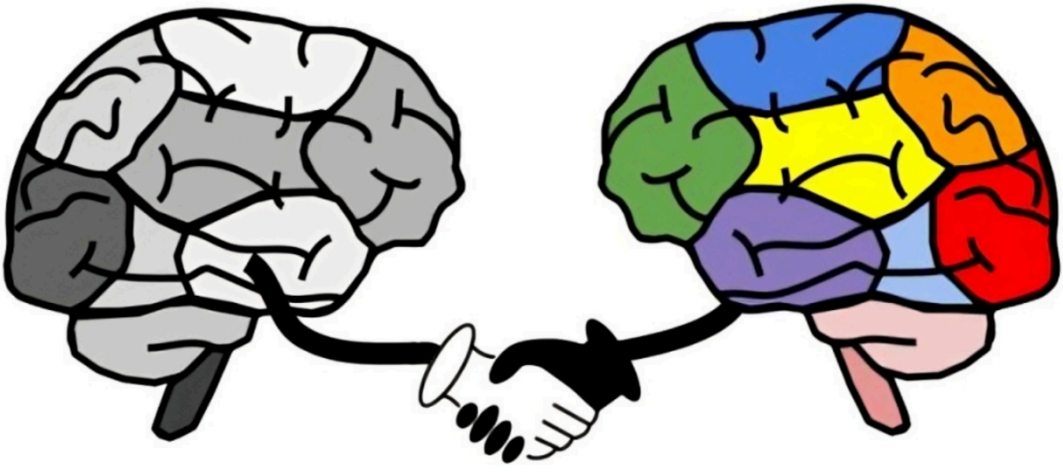
SEBASTIÁN OLAVE HENAO

MEET YOUR BRAIN AND MANAGE YOUR EMOTIONS

1st EDITION



Meet Your Brain and Manage Your Emotions

Sebastián Olave Henao

To my parents,
Whose support and love have guided me through the journey that life is.

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The Beginning

We humans are so insignificant concerning this universe yet so complex. Every person is in a completely different world. It is interesting to me when I am at an airport waiting for a flight. You see so many people from so many different cultures that you wonder how they feel, what's up with their lives, and whether they are good or bad. You see them walk, you see them smile, you see them angry, you see them cry, a mix of emotions that revolves around you and your world with a unique perspective of life. You return from your trip knowing that vacation is over, and the work and study times return. You wish that you were on vacation for the rest of your life, unless you are retired, then lucky you! But whether we enjoy working or studying or not depends solely on us, how we look at these situations, and the way we face them.

At least, for me, studying hard used to stress me very much. Striving to be a great student to accomplish my dream of studying abroad is sacrificing. I felt how all that stress was affecting my health and knew that I had to do something to be able to surpass it. Because of that stress, I started talking with my parents to alleviate my stress in those hard times. I believe that we can change the way we see things to be able to keep on going

in life. When all those overwhelming moments passed, I started viewing my life differently, that not everything is studying all the time, that I have to distract myself and enjoy all those precious moments that life gives me, such as meeting with my family, enjoying learning new things every day, being able to achieve my goals, among many others. Doing those things that make me truly happy gives me the energy to keep going and reach my goals.

This life journey can be influenced by the people surrounding us, but who truly controls it is ourselves, and more deeply, what guides it is our beliefs and emotions. Our emotions guide our lives; you can think about this deeply and discover it true. Emotions influence our behavior, and all of this originates in the one and only brain. This complex organ is of such amazement; it holds who we are and what we can do. Our movements and our thinking originate in the brain. I do know that every single organ in the human body is crucial for our survival, and I include the little appendix too, but our brain is just such an amazing and complex organ that evokes so much interest that I would consider it the king of all organs, the most important of them all. Humans have evolved; with this evolution, we have developed our emotions. Beginning as

necessary for survival, they have become an exciting and deep branch of scientific knowledge. In this book, I voyage into our brain to discover where these emotions emerge. The brain is so complex that every single cell is its world. There are more than 3000 different types of cells in the brain, each doing a specific function with a particular anatomy. This book will share the bases of the brain and go into the central parts where emotion originates. Furthermore, I will show the anatomy of behavior, how emotions influence it, and how all these complex parts of the brain correlate to model what we do.

When touching on the topic of emotions, I want it to be not only scientific but also practical. With this, I want to help those who need it to know how our emotions work and manage them to achieve a whole life. All of us have once suffered difficulties in our lives that have put us down, making us ill and overall overwhelmed without a true vision or goal to keep on going in life. These moments can be a block to our journey in life, and that's why, with this book, I want to share a message of hope with people; as I was able to help myself, I want to be able to support others. I will offer a guide and suggestions on how we can reach the so-wanted happiness, how we can leave those problems that back us down behind and reprogram our brain

into a state of enjoyment with every day in our lives. Without further ado, let's start this crossing

1

Our Brain

- *The Brain*

First, we need to understand what the brain is to go deeper into the anatomic aspects of emotions eventually. The brain is one of the most vital organs in the human body; it controls our thinking, emotions, behavior, movement, and sensations. It is part of the nervous system, which connects our entire body through nerves to the brain. Nerves can instantly send communications to the brain when you feel a sensation.

A real-life example of this is when you are cooking something and the pan is boiling, and you accidentally touch the scorching part of the pan and feel a burning sensation; the nerves immediately sense this intense and painful burn and send a message in an instant to the brain to remove your hand from the hot pan.

The brain contains billions of nervous cells known as neurons, arranged in specific patterns that control the different

functions of the brain. Every part of the brain works together; nonetheless, each has its responsibility, ranging from heart rate to mood.

The cerebrum is the most significant part of the brain (the brain is a whole structure that consists of the cerebrum, cerebellum, and brainstem). The external layer of the cerebrum is the cerebral cortex, also known as the gray matter; it is the region where we process information. Have you ever wondered why the brain is all curved and squiggly? The folded shape gives the brain a larger area of gray matter to process more information.

The brain floats above a substance called cerebrospinal fluid; the choroid plexus produces this substance. This substance flows by the brain and the spinal cord. The illness hydrocephalus happens when there is an obstruction of the flow of the cerebrospinal fluid, resulting in inflammation due to the excessive accumulation of cerebrospinal fluid.

The brain divides itself into two halves called hemispheres; the hemispheres communicate through thick nerve tracts called corpus callosum located in the middle and base of the furrow in the separation between the two hemispheres.

Both the left and right hands are used when playing the piano. What is very curious is that, in reality, the messages sent

through our body to the left hand are sent by the right hemisphere, and the left hemisphere sends the messages to the right hand. That is why you are fostering the activity and coordination of the two hemispheres when playing the piano and doing two-hand activities.

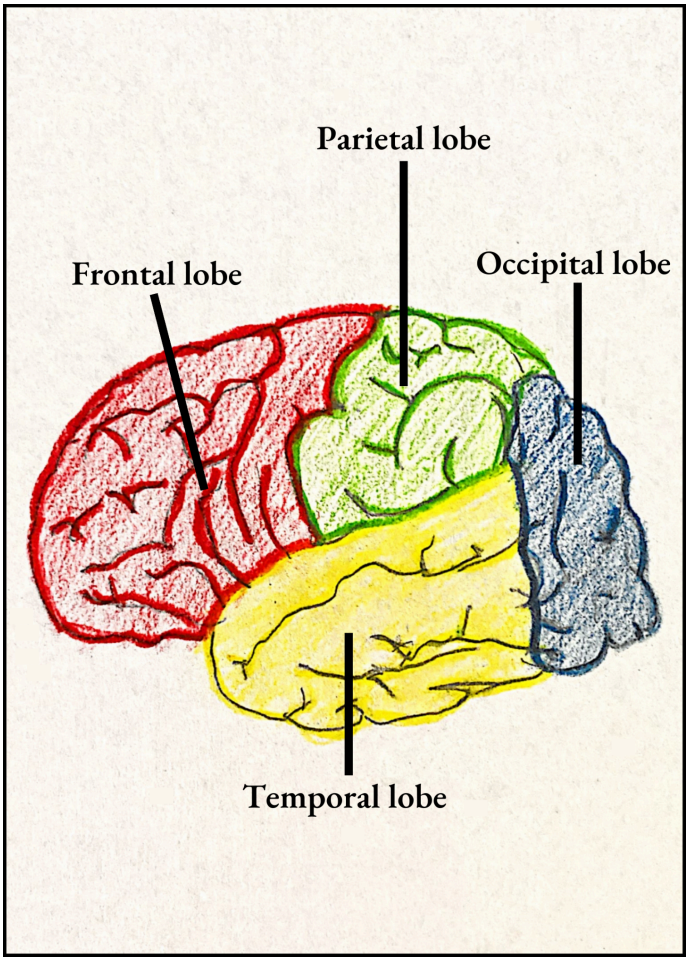
The hemispheres of our brain are divided into four lobes:

- Frontal lobe: Controls our thinking, planification, organization, problem-solving, short-term memory, and movement.

- Parietal lobe: Interprets sensory information like taste, temperature, and touch.

- Occipital lobe: Processes the images our eyes receive and vinculates that information with images stored in our memory.

- Temporal lobe: Processes information from our senses of smell, taste, and audition. It has an important participation in the storage of memory.



A diagram of the cerebrum composed of the four lobes: Frontal, parietal, occipital, and temporal. Own elaboration, based on Clinic, M. (2016, April 20). Presentación de Diapositivas: Cómo funciona el cerebro. https://www.mayoclinic.org/es/brain/sls-20077047?s=1

The meninges are three protective layers surrounding the brain and the spinal cord. These are called the dura mater, the arachnoid mater, and the pia mater. The dura mater is the outermost layer, thick and tough, and it includes two other layers: The periosteal dura mater layer and the meningeal dura mater layer. These layers have spaces that allow for the passage of veins and arteries that supply blood flow to the brain. The arachnoid mater is a thin, weblike layer without nerves and blood vessels; below it, we can find the previously mentioned cerebrospinal fluid that cushions the central nervous system and removes impurities. Finally, the pia mater is a thin membrane surrounding the brain's surface and following its outline. It contains a large number of veins and arteries.

Two sets of blood vessels supply blood and oxygen to the brain: the vertebral and carotid arteries. A loop of blood vessels that connect major arteries is the circle of Willis; it circulates blood throughout the brain from the front to the back. It helps the arterial systems communicate with each other.

- Vertebral arteries: Arteries that follow the spinal column into the skull. These arteries are joined together at the brainstem, and from the basilar artery located in the front

of the brainstem, blood is supplied to the rear sections of the brain.

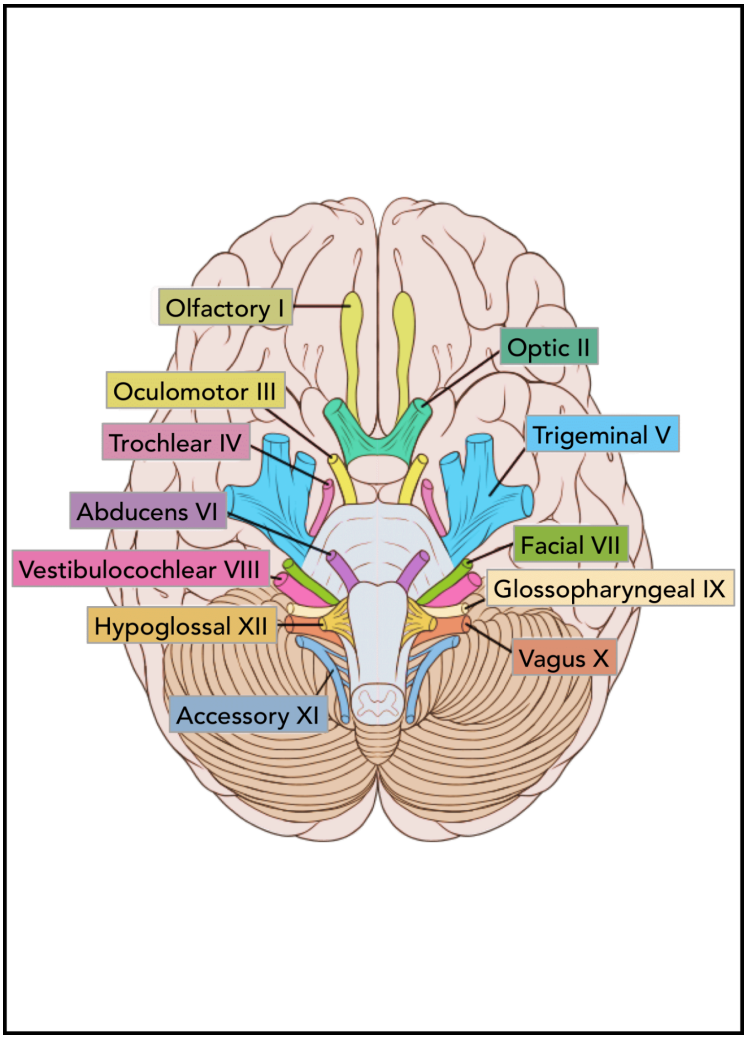
- Carotid arteries: The external carotid arteries locate themselves through the side of the neck, which is why a pulse can be taken when this area is touched. The internal carotid arteries go into the skull and circulate blood to the front section of the brain.

There are 12 cranial nerves in the brain. Their function is to control facial muscles and manage the reactions of the senses. The following table shows the 12 cranial nerves and their respective functions.

1	The olfactory nerve	Plays a role in the sense of smell.
2	The optic nerve	Plays a role in eyesight.
3	The oculomotor nerve	Controls pupil response and eye motion.
4	The trochlear nerve	Controls muscles in the

		eye.
5	The trigeminal nerve	The most complex of the cranial nerves, has sensory and motor functions. It transports sensations from the scalp, teeth, jaw, sinuses, and parts of the mouth and face to the brain, allowing chewing, among other muscle functions.
6	The abducens nerve	Innervates some muscles in the eye.
7	The facial nerve	Supports face movement, taste, and glandular activity, among other functions.
8	The vestibulocochlear nerve	Facilitates balance and hearing.
9	The glossopharyngeal nerve	Allows taste, ear, and throat movement,

		among other functions.
10	The vagus nerve	Allows sensations around the ear and digestive system. It controls motor activity in the heart, throat, and digestive system.
11	The accessory nerve	Innervates muscles in the head, neck, and shoulders.
12	The hypoglossal nerve	Supplies motor activity to the tongue.



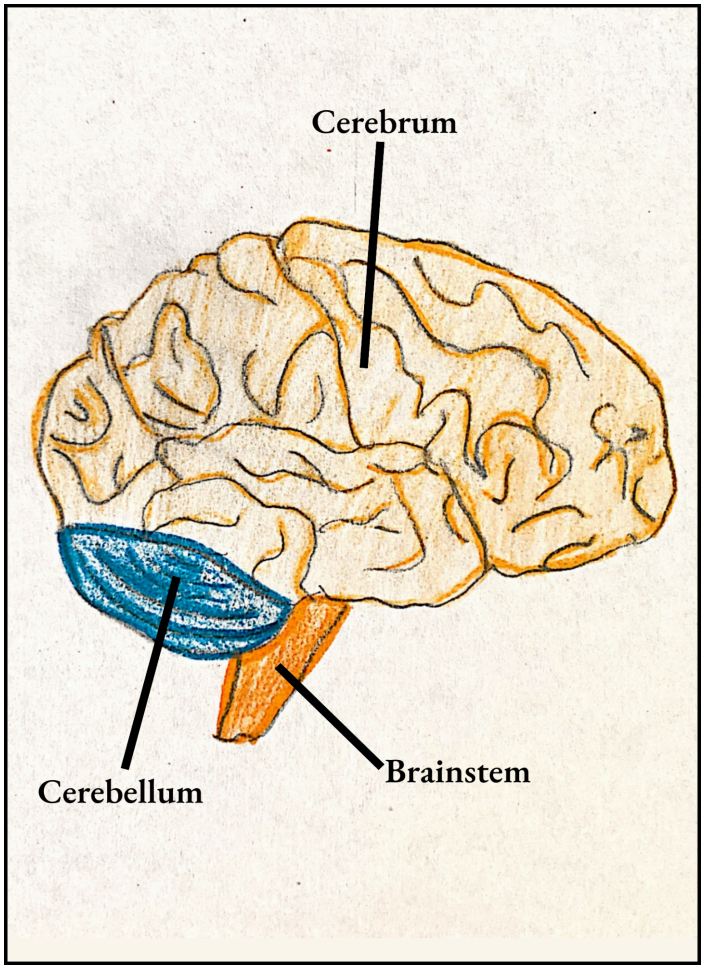
A diagram with the 12 cranial nerves inside the brain. Retrieved from Sanders, K. (2020, December 20). *Summary of the cranial nerves*. TeachMeAnatomy. https://teachmeanatomy.info/head/cranial-nerves/summary/

- *The Brainstem*

The brainstem connects the brain with the spinal cord; it consists of the midbrain, the pons, and the medulla. The midbrain, also known as the mesencephalon, has a range of different neuron clusters, neural pathways, and structures. Distinct features of the midbrain allow us to hear, move, and calculate responses and environmental changes. The midbrain contains the substantia nigra, an area rich in dopamine neurons and part of the basal ganglia that enables movement and coordination. Furthermore, the pons are the origin of four of the 12 cranial nerves, enabling tear production, chewing, blinking, focusing vision, balance, hearing, and facial expressions. The pons connects the midbrain and the medulla; the medulla is where the brain meets the spinal cord. The medulla has a range of functions regulating heart rhythm, breathing, blood flow, and oxygen and carbon dioxide levels. The medulla is also responsible for reflexive activities such as sneezing, vomiting, coughing, and swallowing.

- *The Cerebellum*

The cerebellum is often described as the shape of a butterfly because when cut axially, it looks like one. The cerebellum is below the cerebrum; it combines sensory information from the eyes, ears, and muscles to help coordinate movement and maintain balance. Meanwhile, the brainstem binds the cerebellum with the spinal cord. The brainstem also controls many vital functions for life, such as breathing, heart rate, and blood pressure; this area also has an essential role in sleep. Some studies have found that the cerebellum has a role in emotions and social behavior, and it's involved in addiction, autism, and schizophrenia.



A sagittal view of the brain is composed of the cerebellum, the brainstem, and the cerebrum. Own elaboration, based on Johns Hopkins Medicine, J. H. (2021, July 14). Brain anatomy and how the brain works. Johns Hopkins Medicine. https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain

The Nervous System

All previously mentioned parts of the brain make up a portion of the nervous system. The nervous system is an organized structure of nerves that permits the organism to relate to its external and internal environments. These nerves transmit information and signals across different parts of the body. The nervous system is divided into three: The central nervous system, peripheral nervous system, and glandular nervous system.

The central nervous system is made up of the brain and the spinal cord, and it is where mental life is found. The peripheral nervous system consists of all of the nerves of our body, except for the ones in the brain and the spinal cord. It acts as a communication transmitter between the brain and the body's extremities. When feeling pain, that signal travels from the spot of the pain to our brain in a fraction of a second, as mentioned in the starting pages of the book.

The peripheral nervous system is divided into the somatic and autonomic nervous systems. The somatic nervous system is the structure that controls all our muscles at our will, while the autonomic nervous system is involuntary, as we cannot control its function. Nevertheless, the structure that controls the

autonomic nervous system is the hypothalamus, which will be explained further in the book. The autonomic nervous system is divided into two: sympathetic and parasympathetic nervous systems. The sympathetic nervous system activates the organism and prepares it for activeness; breathing and heart rate go faster when activated. The parasympathetic nervous system re-establishes the organism, relaxing it from the initial activation.

Lastly, the glandular nervous system has two roots: An exocrine and an endocrine system. The exocrine glands are in charge of external secretion; for example, when you eat something spicy and start secreting a lot of saliva. Meanwhile, the endocrine glands secrete substances inside the body that are directed to the blood, such as hormones, which are related to metabolism and emotions.

- *The Pituitary Gland*

The pituitary gland, also known as the hypophysis, is the gland that dominates all other glands; it is in charge of secreting tropic hormones.

- Cortisol: Stress hormone that relates to adrenaline.
- Estrogen and Androgens: Estrogen is secreted by the ovaries, and the testicles secrete androgens; the most known androgen is testosterone. Estrogen is the primary sex hormone for women, while testosterone is the main sex hormone for men.
- Thyroxine: A hormone secreted by the thyroid, it maintains the organism with energy. When the secretion of this hormone increases, an illness called hyperthyroidism can occur, and when it decreases, an illness called hypothyroidism can happen.
- Insulin and Glucagon: Hormones secreted by the pancreas, glucagon increases blood sugar levels, and insulin decreases blood sugar levels.

- Adrenaline, Norepinephrine, and Cortisol: Hormones secreted by the adrenal glands. Adrenaline relates to fear, norepinephrine to aggressiveness, and cortisol to stress.

- *Neurotransmitters*

Neurotransmitters are the body's chemical messengers. They carry different chemical signals from neuron to neuron; these messages are critical for correct body functioning. Among some essential functions, neurotransmitters help control breathing, muscle movement, and hormone regulation. Many deep structures in the brain can produce neurotransmitters; they are stored in sacs called synaptic vesicles. When neurotransmitters are released, they connect with a specific receptor on the respective cell they are directed to. Once bonded, the neurotransmitter triggers a change or action in the cell, like releasing hormones. Neurotransmitters can be excitatory, activating the neuron to transmit the message. Inhibitory neurotransmitters block chemical messages from being passed. Modulatory neurotransmitters influence the effects of other chemical messengers. Once a neurotransmitter has delivered its message, the molecules are cleared from the synaptic cleft, the space between neurons to communicate with each other. Various types of neurotransmitters have essential functions regarding emotions and behavior. Among the most important neurotransmitters are dopamine (a neurotransmitter that plays a

role in the body's reward system, feeling pleasure, and learning), glutamate (the most abundant neurotransmitter in the brain, has a vital role in cognitive functions such as thinking, learning, and memory), epinephrine (also known as adrenaline, it is responsible for fear and stress), serotonin (neurotransmitter regulating mood, sleep patterns, sexuality, anxiety, hunger, and pain), oxytocin (the neurotransmitter that controls essential aspects of the reproductive system), and acetylcholine (a neurotransmitter that has to do with muscle contractions, memory, motivation, sexual desire, sleep, and learning). As it has been seen, neurotransmitters play an influential role in emotional responses and regulating emotion processing.

- *Neurons*

The anatomic functional unit of the whole nervous system is the neuron, they are specialized cells in the nervous system in charge of transmitting information; they do all of the work inside the nervous system. The following are the parts that compose a neuron:

- Dendrite: Branches that go out of the neuron's body; the information enters the neuron through these branches.
- Soma: The cell body of the neuron.
- Nucleus: The center of the neuron where the information is processed.
- Axon: An extension of the cell, it transports a nervous impulse that travels at a velocity of 120 x 100 m/s.
- Myelin Sheath: It is what covers the axon. It increases the speed of the impulse.
- Telodendria: The ending branches of the axon where neurotransmitters are segregated.

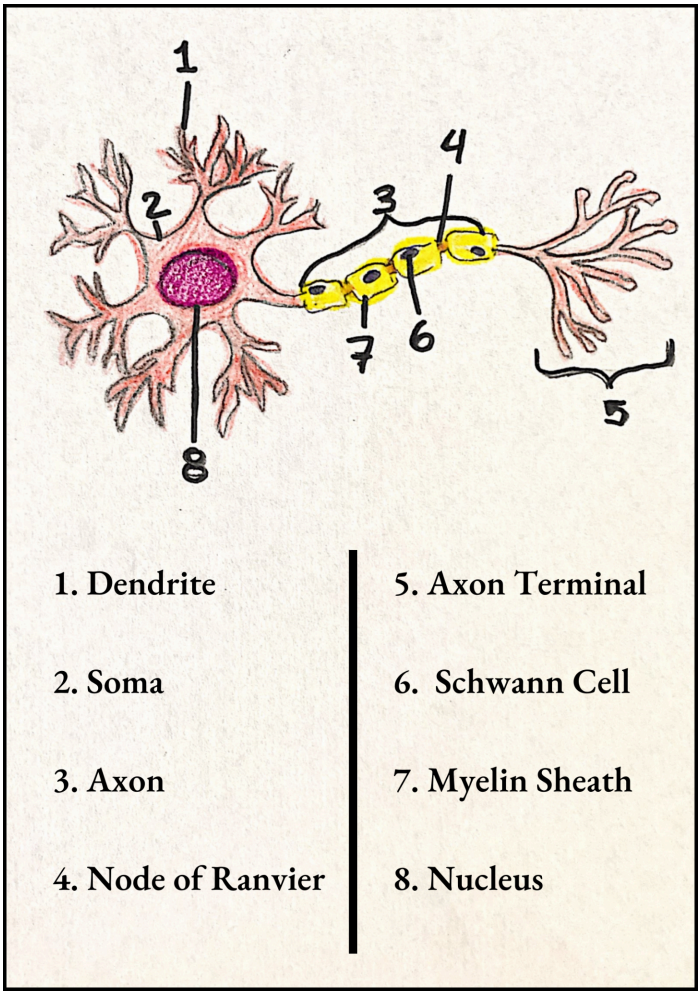


Diagram of a neuron with its respective structure. Own elaboration, based on Admin. (2020, July 28). *A labelled diagram of neuron with detailed explanations*. BYJUS. https://byjus.com/biology/diagram-of-neuron/

The communication between neurons is called synaptic transmissions; they are electrochemical transmissions between neurons. Neurons are protected by other types of cells called glial or neuroglial cells. Different types of these cells, such as astrocytes star-shaped cells, give physical support to the neurons, making them compact and nourishing them. The microglial cells have a function to defend the organism from illnesses and clean the brain. This cell also produces the myelin sheath in the central nervous system.

There are three main types of neurons: The sensitive neuron that transports information from the senses to the encephalon, the motor neuron that activates muscles, and the associative neuron that connects neurons and participates in mental functions.

The Limbic System

The limbic system is a series of structures located in the brain that manage cognitive, behavioral, and emotional processes.

Emotions and behavior are present in a universal manner. This means that race, gender, or ethnicity does not influence emotion. Emotions are not determined culturally but are interpreted differently depending on the culture. Different universal signs will always mean the same anywhere in the world; an example is a smile, which will continuously transmit happiness anywhere.

The study of emotions has been around since old times; beginning with a more philosophical approximation, Plato mentions that the mind works as a car with two horses, one representing the affective component or the good horse and the other being the appetitive or the wrong horse. Aristotle expands on the subject of emotions and believes that emotions are all affections of the soul accompanied by pleasure or pain.

The following are the main parts of the limbic system that are key for generating emotions and behavior:

- *Amygdala*

The amygdala is a small part of the brain that is a crucial emotional processing center. It can connect emotions to many other brain abilities, most importantly memories, learning, and the different senses. Failures in its functionality can result in disruptive feelings.

The amygdala is located inside the temporal lobe. It has a small almond-shaped structure, and it is very influential in human survival as it can detect danger automatically. Fear is the primary emotion that the amygdala controls, making this the exact reason it is vital for human survival as it processes things we hear and see and uses that information to know what is dangerous in the future; nevertheless, it can remember these fearful experiences and as a consequence will create an avoidance to them every time they are encountered.

The amygdala not only plays a role in anxiety and fear but also has to do with aggression, learning through rewards and punishment, parenting, remembering how to do things without remembering how they were learned, social communication and understanding, the correlation between emotions and memory, behaviors related to addiction, among other functions. That is

why the amygdala is a significant nucleus of who we are as its relation with emotions is immense.

Now that we know about the amygdala, the limbic system, and fear, I will explain a reaction in a real-life situation. Imagine yourself walking in a forest when you suddenly encounter a bear. You see how the bear is coming closer to you, so different reactions inside the brain happen. The first reaction that occurs in the amygdala is fear. The bear has been correlated with other dangerous experiences and situations of bear attacks. The information that the eyes see is processed by different parts of the brain, including the already mentioned amygdala; this reacts to activate the sympathetic nervous system to prepare for danger. Blood pressure increases, muscles get tensioned, and an adrenaline rush happens; this reaction helps the body get ready to run. You run from the bear, and you get to a safe point. What is left in the body is to calm down; that is when the parasympathetic nervous system takes action and starts relaxing muscles and decreasing blood pressure. Emotions generate feelings; the insula, a part of the limbic system, makes emotions conscious. When you see danger, you first react to it. After encountering the bear, the reaction is to run to a safe point, and

once this one is reached, the insula makes the emotion conscious, and you start to feel scared.

The amygdala is mainly made out of neurons and glial cells. Many disorders that have to do with the amygdala are psychiatric and these disruptions in brain functions commonly affect mental health. Among these disorders, there is anxiety, mood, and post-traumatic stress disorder (PTSD). Other amygdala-related conditions can include Alzheimer's disease, autism spectrum and epilepsy. Some signs that show that there might be something off with the amygdala are emotional changes.

If you want to take good care of your amygdala, having a healthy food lifestyle is good. This doesn't mean leaving food you like that can be unhealthy, such as delicious hamburgers and fast food. I mean, even I love to eat those, and I couldn't imagine not being able to give myself some contentment from time to time. But nourishment does have to be balanced and not exceeded as other health-related problems can occur. Eating a balanced diet will not only take good care of your amygdala but also your entire body. Something of great importance is to protect yourself from injuries, mainly in your head, as strong hits can damage structures in the brain; that is why if you practice risky sports

such as hiking, skating, or cycling, you should always wear helmets and protection.

Lastly, amygdala damage can remove the ability to feel fear or anxiety. Not feeling fear might sound good, but we must remember that feeling these emotions and sensations is critical to survival.

- *Hippocampus*

The hippocampus is part of a structure called the hippocampal formation. Located on the underside of each temporal lobe, it supports memory, learning, navigation, and perception of space. The hippocampus sends memories to the adequate sections of the cerebral lobes and brain structures to store and regain when necessary.

- *Hypothalamus*

The hypothalamus is a structure in charge of controlling emotions; it regulates body temperature and controls different

basic needs for survival, such as hunger, sleep, excretion, thirst, metabolic control, fear, aggression, mating, and maternal care, among others. The hypothalamus is located above the pituitary gland; it sends chemical messages that control its functions. It plays a vital role in the aspects of memory, and it is essential for emotions as it creates emotional responses and regulates their expression.

- *Thalamus*

The thalamus is a structure that acts as a barrier for communication that passes through the spinal cord and the cerebral hemispheres. It is related to the information that is processed by the eyes. External impulses will arrive at the thalamus, passing this impulse toward other brain structures. The thalamus has a role in the process of fear.

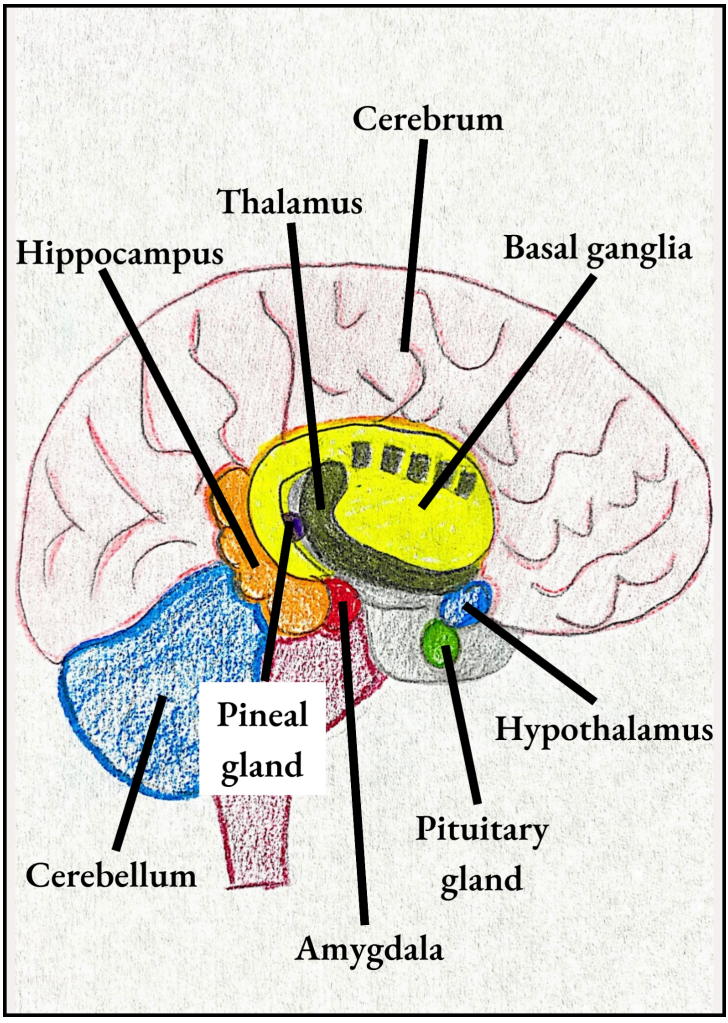


Diagram of the limbic system magnified. Own elaboration, based on Lizzy Wicks. (2022, December 7). *Anxiety & stress: Lizzy Wicks hope therapy ltd: Therapy and counseling in Weybridge and London*. Lizzy Wicks Hope Therapy Ltd. https://www.lizzywicks.com/services/anxiety-stress/

2

A Deep Dive into Emotions

The Primary Emotions

The author and psychiatrist Marian Rojas Estapé describes emotions as "affective states of more or less intensity, the response that the body offers to circumstances in life, to the events of our day to day, to our subjectivity, that show our way of being and express how we feel." Cómo Hacer Que Te Pasen Cosas Buenas (Estapé, 2018, p. 147). The authors Tiziana Cotrufo and Jesús Mariano Ureña Bares describe emotion as "In the branch of neuroscience it is talked about emotions to refer to a set of physiological, cognitive, subjective and motor changes that get aside of conscious determination that a stimulus contains positive or negative value in a concrete context and with relation to the objective of an individual in a determined moment of his life." El Cerebro Y Las Emociones (Cotrufo,T ., Ureña Bares, 2016, p. 17). From these two descriptions of emotions, we can take that emotions are those responses to a

series of circumstances and events that affect our body's motor, cognitive, subjective, and physiological processes; being negative and positive, emotions represent the way we feel according to those situations we are living in that exact time of our lives.

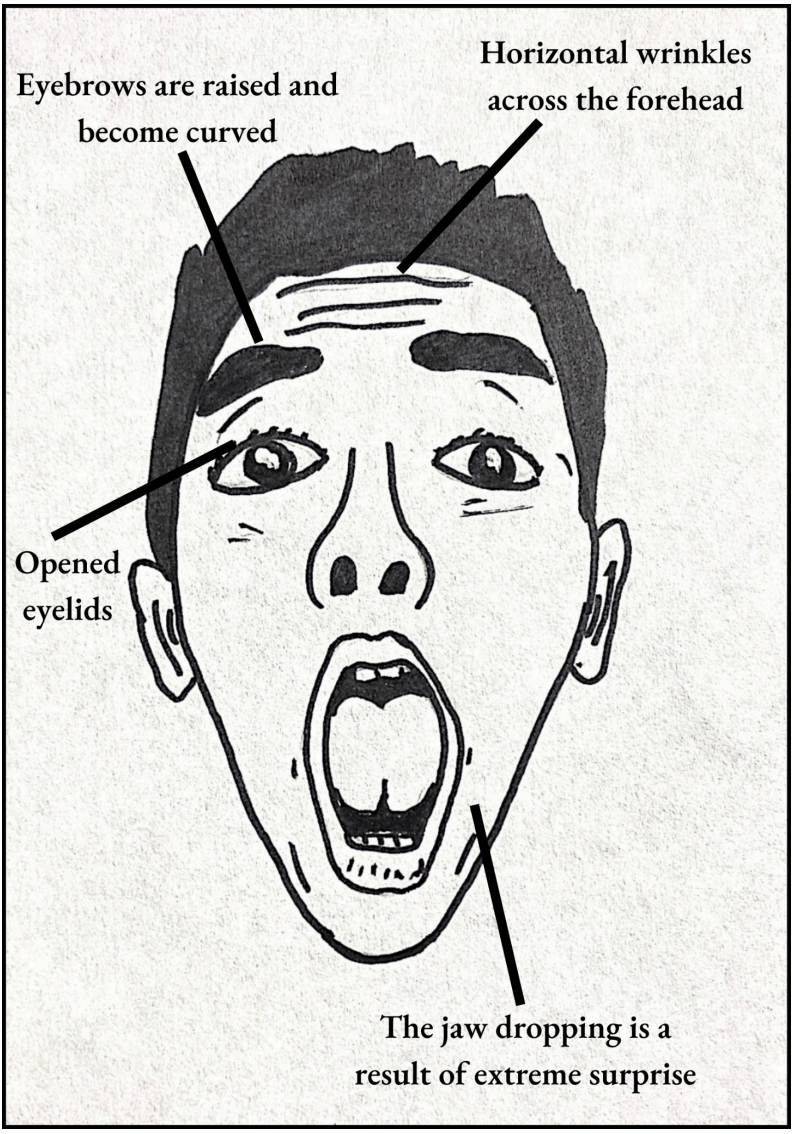
Among all the emotions we experience, six are the most important: sadness, happiness, fear, anger, surprise, and disgust. Happiness will have its chapter at the end of the book; as of now, I will explain the other five primary emotions, their neurobiology, and what stimuli cause them.

- *Surprise*

Surprise is one of the least studied emotions compared to sadness or fear. However, it still plays a vital role in human survival as it is the emotion evoked when encountering unexpected situations. Compared to other primary emotions, it is a neutral one that, after being expressed, disappears quickly, giving way to different emotions. Authors Tiziana Cotrufo and Jesús Mariano Ureña Bares state, "What is out of all doubt is that surprise contributes to focus attention and working memory in the information being acquired, it would interfere with the ease

of learning associated with the events that have caused it". El Cerebro Y Las Emociones (Cotrufo,T ., Ureña Bares, 2016, p. 86).

As memory plays a vital role in surprise, the hippocampus for long-term memory activates when this unexpected event happens; other parts of the brain that activate with the emotion of surprise are the cortices close to the hippocampus.


Eyebrows are raised and become curved
Horizontal wrinkles across the forehead
Opened eyelids
The jaw dropping is a result of extreme surprise

The facial expressions of the emotion surprise. Own elaboration.

- *Disgust*

The emotion of disgust can be seen as the body's response to watching something repugnant, such as worms in your food. The primary function of feeling disgusted is to avoid potential sources of disease, reject harmful things that can go into the body, and protect it. As we know, emotions have been developed by the human body for our survival. So, disgust is believed to be an emotion that has a protective effect on the human body before possibly dangerous food.

The most common stimulus that can display disgust is rotten food. This food in a bad state is related to hazardous bacteria that can enter the organism and make it sick. Taking good care of the body to prevent potential disease is a good measure, but some people take it to the extreme by constantly washing their hands. This hypersensitivity is a consequence of damage to the insular cortex. Studies have found that the insular cortex neurons correlate with the expression of disgust and the posterior insula.

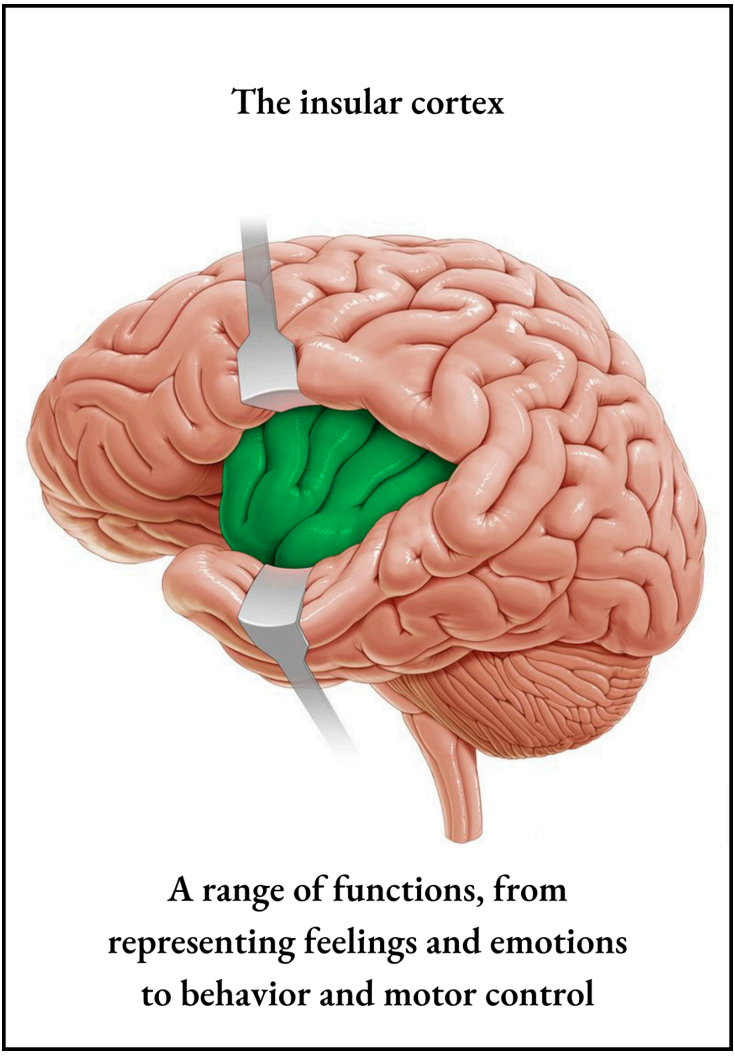
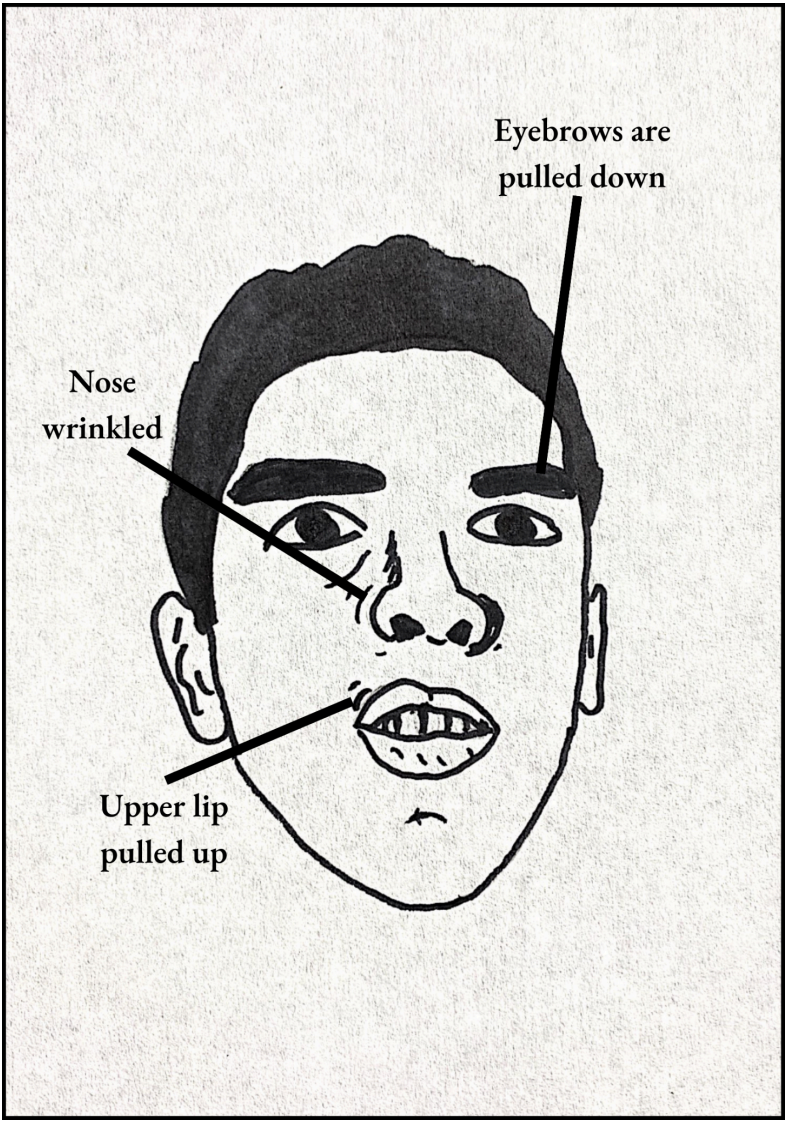


Diagram of the insular cortex deep inside the brain. Image retrieved from Vasković, J. (2023, November 21). *Insula*. Kenhub. https://www.kenhub.com/en/library/anatomy/insula-en



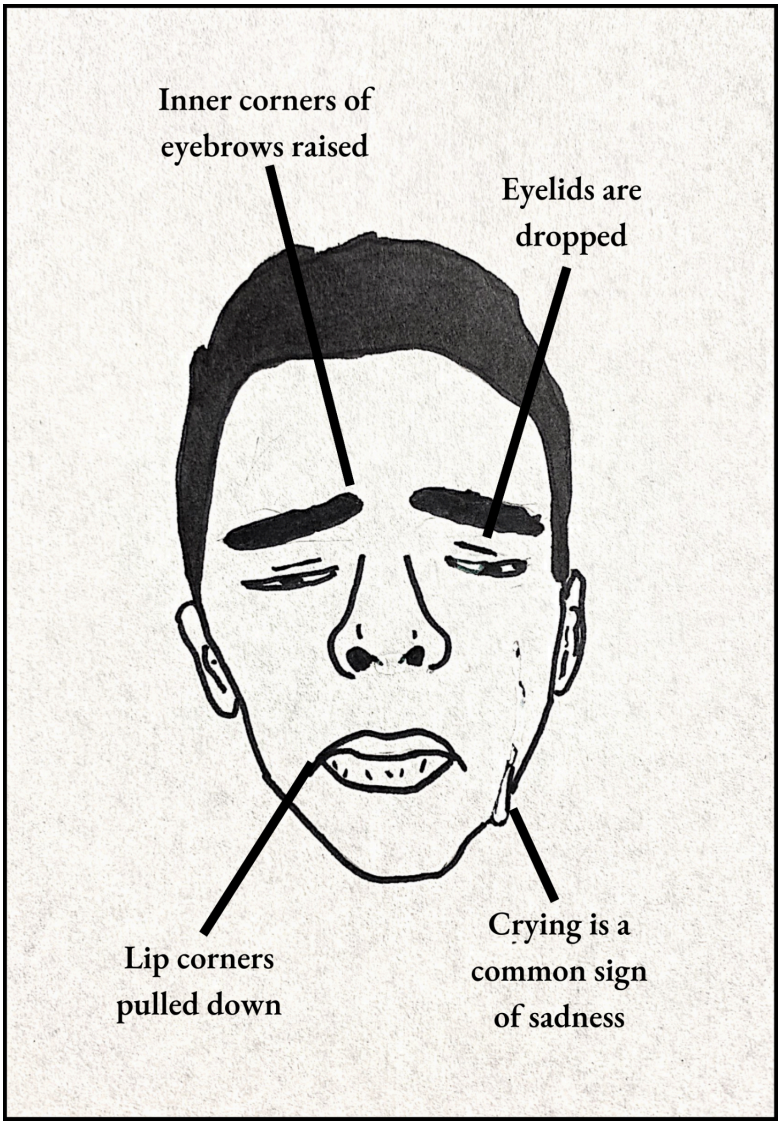
The facial expressions of the emotion of disgust. Own elaboration.

- *Sadness*

Sadness can be considered a negative emotion, the opposite of happiness. This emotion is displayed with low self-esteem, discouragement, melancholy, and energy loss. Sadness can range from short sad moments to depression, an illness that will be explained further in the book.

This emotion relates to an overload in the body as a response to sudden negative situations and life changes. Sadness can be most commonly displayed when a person cries, but I will explain the function of crying for the organism later. Sadness is a universally recognizable emotion; studies have shown that the part of the brain that activates sadness is the prefrontal medial cortex. Sadness can also be related to other various emotions and memories, which is why the hippocampus, amygdala, hypothalamus, and brainstem can activate in a sadness reaction.

The function of sadness in evolution is similar to disgust; it shows the bodily events, situations, and aspects in life that have to be avoided for the proper functionality of the body, and so to prevent mental issues, even though sadness itself can lead to cognitive problems, that is why it has to be well controlled.



The facial expressions of the emotion of sadness. Own elaboration.

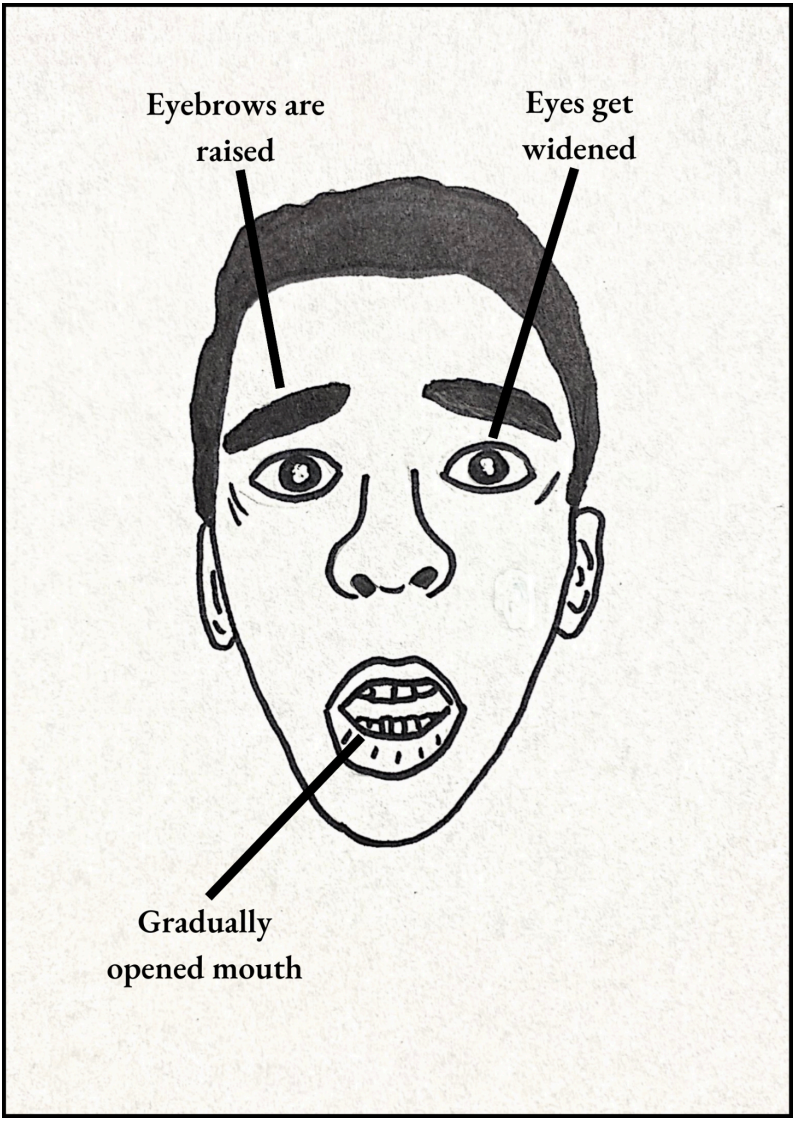
- *Fear*

Fear is a response to sensations of danger, activating defense or escape mechanisms. Since the beginning, this emotion has been crucial for human survival. “Fear makes the person escape possible danger but rejects exploration and opportunities.” El Cerebro Y Las Emociones (Cotrufo,T ., Ureña Bares, 2016, p. 68).

Fear stimuli are generally sensory and processed through the thalamus and the vital structure of the amygdala. Other brain structures related to fear are the stria terminalis (a pathway between the hypothalamus and the amygdala), the ventral hippocampus, and the medial prefrontal cortex, which is thought to evaluate the presence or absence of a threat. Once the threat or danger is detected, the expression of fear or anxiety is triggered; different defensive behaviors can happen depending on the situation.

Phobias are highly irrational fears of something. Some common phobias are acrophobia (fear of heights) and arachnophobia (intense fear of spiders). However, those individuals who face damage in the amygdala may not show fear of different stimuli that would generate fear in other individuals.

Fear relates to trauma; in infancy, an individual could have experienced a traumatic event that would affect him in the future, giving him intense fear and rejection in similar events. This trauma can lead to different disorders, such as anxiety or PTSD (post-traumatic stress disorder), which will be later explained.



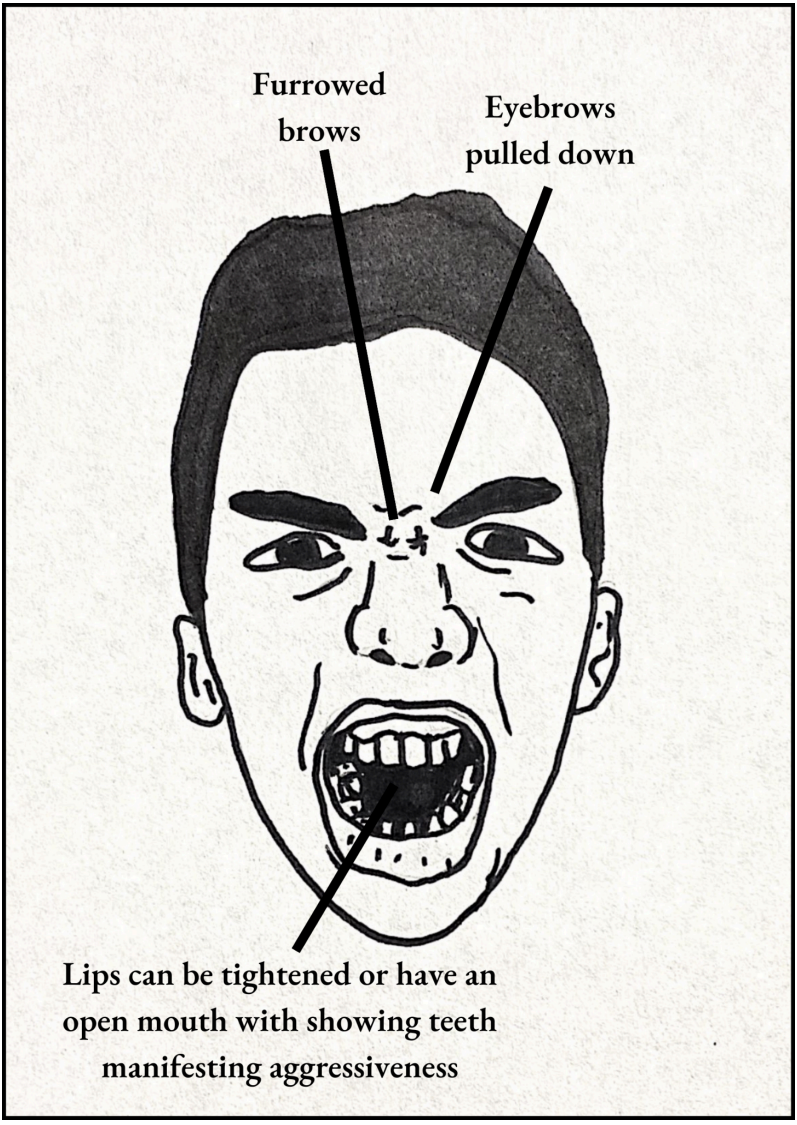
The facial expressions of the emotion of fear. Own elaboration.

- *Anger*

Anger is provoked by frustration, a negative functional emotion triggered by diverse aversive circumstances such as not receiving an expected award or not achieving a goal. This emotion can be destructive and even auto destructive. Throughout evolution, it has played an essential role in defense against attacks and aggression.

Anger is expressed through aggressive behaviors and body changes. The orbital frontal regions get activated, as well as the amygdala. Damages in the septum located in the cingulate cortex in individuals have shown uncontrollable aggressiveness. The hippocampus, prefrontal cortex, and thalamus are among other structures that activate anger.

Anger can lead to a disorder called rage disorder; the different disorders mentioned in this first section will be explained in the next section of this chapter.


Furrowed brows
Eyebrows pulled down
Lips can be tightened or have an open mouth with showing teeth manifesting aggressiveness

The facial expressions of the emotion anger. Own elaboration.

Emotion	Stimuli	Real-Life Example	Cognition	Emotional Behavior	Function of the Emotion
SURPRISE	New object	A surprise birthday party	What is it?	Alertness, raise eyebrows, jaw drops	Attention and orientation
DISGUST	Creepy object	Your food plate has worms in it	Poisonous	Vomit, wrinkling of the nose, closing nostrils	Avoiding body sickness
SADNESS	Emotional charged memory	You lose someone you love	Abandon	Cry, ask for help, low energy, guilt	Sign for help or finding
ANGER	Obstacle	An imprudent driver crashes into you	Enemy	Attack and fight, shouting, cursing, breaking things	Destroy the enemy
FEAR	Threat	Getting robbed at knifepoint	Danger	Run and escape, open eyes and mouth, fast heartbeat	Protection

Emotions diagram with five primary emotions except happiness, own creation, based on FIG. 2. El Cerebro Y Las Emociones (Cotrufo,T ., Urena Bares, 2016, p. 23).

Behavior

Genetics is a big part of behavior; the offspring inherits the traits from their parents. We can inherit physical characteristics such as height, skin color, eye color, etc. The branch of psychology is interested in the inheritance of the nervous system, as this is where mental life is found.

Maturation refers to biologically pre-programmed changes; behavior initially appears as it is but can change as the person ages. Both inheritance and maturation are crucial factors that determine human behavior. Still, external factors can influence someone's behavior, mainly social factors that have an immense capability of shaping behavior. There is a fundamental concept regarding behavior: favorable and disfavorable environments. An offspring can be predisposed to certain physiological traits, but its surroundings can change these predispositions. Two parents can measure 1.80 meters, and the offspring is predisposed to measure the height mentioned before, but it results that there are different issues regarding food and there are low protein stimuli; this is a disfavorable environment, and the offspring will not grow as tall as its parents. Our genetic

predisposition can change into good or bad depending on our environment.

As we have seen previously, emotions can significantly cause behavioral changes that can impact the entire organism. Anger makes us aggressive. Sadness makes us less productive and unenergetic. Disgust makes us more avoiding. Fear makes us incapable. Surprise makes us curious and imaginative. Emotions and behavior are connected as physiological responses are created by emotions affecting our conduct. Finally, emotional distress can be a consequence of behavior changes such as self-injury or mass eating. Among other psychological and physical issues, this happens when emotions overwhelm us.

When Emotions Overwhelm Us

Emotions have accompanied us throughout our evolutionary history and are crucial to our survival as humans. However, emotions can become overwhelming even though they are critical to survival. Overloading emotions can adversely affect an individual as these submerge the individual due to the different overwhelming events happening to him. With this, productivity and proper life continuity seem to halt. When emotions overwhelm an individual deeply, they can be harmful to the brain and cause various illnesses and disorders.

- *Disorders and Emotions*

Many mental health conditions affect human beings' capabilities. Still, some can be more recognized, of which the most known and prominent in the actual times would include rage, stress, anxiety, PTSD (post-traumatic stress disorder), and depression.

- *Rage*

Rage disorder is when there is uncontrollable anger as a consequence of an event that evokes this emotion. It is an explosive disorder that results in constant impulsive anger blowups, which are accompanied by aggressive behavior.

- *Stress*

Stress is when the mind is in tension and worries due to ongoing difficulties. This can lead to other disorders depending on how the person reacts to stress. Even though stress is a natural reaction to encountering hard times in our lives, it can become very negative; suffering from daily stress can cause repercussions on an individual's health. There can be different reactions from the body to stress, like headaches, fatigue, or difficulty breathing. Some leading causes of stress are a lot of pressure, significant changes in life, or too many overwhelming responsibilities.

- *Anxiety*

People tend to think that stress and anxiety are the same thing. Still, anxiety, in comparison to stress, is the excessive worry about things that can happen in the future. Situations that can happen in the future worry individuals, even though these do not have a certain chance of happening.

- *PTSD*

Post-traumatic stress disorder, by its acronym PTSD, is a mental health condition where there is emotional stress after a traumatic, shocking event. An example of this is soldiers who have fought in a war that have always put themselves at risk. Post-war traumatized soldiers recall their traumatic war experiences with different stimuli, such as strong noises that resemble gunshots or explosions. PTSD can have the effect of constantly being on edge, difficulty concentrating, and sleep problems.

- *Depression*

Author Marian Rojas Estapé mentions, “Depressions constitutes in actuality one of the great modern society epidemics” Cómo Hacer Que Te Pasen Cosas Buenas (Estapé, 2018, p. 88). This mental illness that many in the world suffer from can be so harmful that the only way that people find to get rid of it is by committing suicide. Depression is the mental illness of sadness; many negative symptoms can result from depression, its most significant symptom being a low desire to live without a right objective in life to keep going. Depression leaves the person without energy; it is truly a deep, constant sadness.

There are so many things that can overwhelm us in life and make us feel troubled emotions; challenging moments in life can bring us down and cause us a lot of mental and health issues. In the next section of this chapter, we will see what we can do to manage all of those negative emotions to keep on going in life.

Managing Emotions

Growing up, children are susceptible to many emotional changes depending on their surroundings and cultural context. One significant period of emotion regulation is adolescence, where the development of emotion regulation is dynamic. Adolescents can have notable self-regulation challenges, and many try to improve their emotion regulation skills. One good strategy is cognitive reappraisal, which involves thinking about challenging emotional stimuli differently to change their affective import.

Parents greatly influence children's behavior and emotions, and improving parent emotion regulation skills could be a positive way of promoting emotion regulation development in young children. Young children rely on their parents to regulate their emotions. Still, there is a different story for adolescents, as they are likely to turn to friends or themselves to regulate their emotions.

Being able to manage your emotions is very important as this can offer a significant benefit in your daily life. You can improve your mood and relationships and have a healthier life overall.

- *Tips and Strategies*

In this section, I want to mention many great strategies that we can use to regulate and manage our overwhelming emotions. In the making of this book, I have tried them, and they have indeed been a blessing as I have become a person with a renewed vision of what true life is.

Loving

When you love, you leave all negative emotions behind, and you stop hating, bringing you a handful of new positive emotions and possibilities. You start having a better connection with yourself, and your self-love and love for others will improve, making a better relationship with the people surrounding you. By starting to love, you stop judging others and even yourself, you stop criticizing, and your mind gets a new perspective of love and connections with people. Apart from having a better

mindset, you can have many health benefits; loving can improve the immune system, blood pressure levels, and even quicker healing, among other health benefits. Love is one great medicine.

Crying

Crying is a body response to feeling sad and overwhelmed that can have significant benefits to feel better in hard times. Crying can help you release tensions and repressed emotions to regain equilibrium; cortisol, the hormone of stress and anxiety, is released when you cry. Sometimes, I can feel very overwhelmed because of studying and different situations that can happen in my life, that is why I occasionally decide to cry and talk with my parents to leave all of that tension behind. Doing this can be very relieving; you leave all stress and negativity behind to keep going with your day. It is safe to say that you should not cry every time you feel overwhelmed, as crying too often could adversely affect your health. There is a range of strategies to choose from to manage those negative emotions.

Forgiving

When you don't forgive, you start feeling a black hole in your heart, a resentment that will not let you feel at peace with yourself and others. By forgiving, you are improving your connection and relationship with other people; you are restoring a relationship and will no longer take that load you were carrying on your back all that time. Apart from a positive emotional balance, you will have personal growth. We heal a heart full of resentment and unforgiveness, a blocked heart, allowing us to have full lives.

Leaving the past behind

Stuck in the past, you can't progress in the present, nor will you build a promising future. By constantly recalling negative thoughts, you start to develop negative patterns in your mind, which can cause constant negative emotions. Don't repeat obsessive ideas repeatedly; accept the bad feeling and reflect on ways to improve yourself in the present. Once you leave the past behind, you can focus on what is important in the present; you

will leave all those negative emotions, guilt, and blame behind. The energy wasted on pointless thinking can now be used to improve and become better individuals. Let things go and move ahead.

Going outside

Take advantage of your free time to enjoy nature, walk in the park, concentrate on the birds chirping, admire the trees, plants, and flowers, and take in some fresh air. Don't limit yourself; go outside and explore new places; go to the mall to go shopping. Your physical and mental health will significantly improve as you are healthily distracting your mind. Doing this will give you a boost of tranquility.

Meditation and Relaxation

The best way of relaxing is doing something you like, reading your favorite book, doing art, watching funny videos, and laughing. You can try other types of relaxation, such as

meditation, focusing on your breath, and clearing your mind from distractions. You will start to get a state of peace that will genuinely help you in your daily life, your stress and anxiety levels will lower significantly, and your mind will be less buried in overwhelming thinking.

Talk with someone you trust

Talking with a friend or family member when you are having a difficult time can help you let off steam. When I feel very stressed and overwhelmed with things that have happened to me throughout the week or the day, I always talk with my parents; their presence makes me feel much better, letting go of all of that negativity and being able to keep going with my day.

Professional help

Sometimes you may not be able to regulate your emotions by yourself, even being able to reach a decreasing low mental health, obtaining possible disorders and mental illnesses. That is,

when seeking professional help is a good choice, professionals such as psychiatrists will address your mental health difficulties to improve your health and safety. You might have a fear of seeking this help as it is a new step in your life, but these are the people that you can trust who will care for you and your well-being.

Gratefulness

We don't realize how fortunate we are for the things we have. We must be thankful for all those beautiful things that life gives us. Having gratitude can have many benefits; it can bring us a lot of happiness and make us more positive, and we will be more optimistic and healthier. Every day, we wake up and should be grateful for a new day.

Exercise

Exercise is great for feeling better; exercising has many benefits. Doing exercise can reduce stress and anxiety levels; it is

also proven that exercise enriches you with dopamine, the well-being and happiness neurotransmitter. Apart from that, you will start to get in better shape, which will make you feel more confident in yourself, and you will start getting more endurance to study, work, and overall be productive for extended periods. Exercise has benefited me as I have seen several improvements, ranging from better endurance for my basketball games to getting better at studying. Exercising is a great free medicine for many issues.

Music

Music has excellent benefits when it comes to feeling better; it can reduce stress, anxiety, and even pain. Listening to relaxing music can reduce cortisol levels and can help you gain healthy heart rate levels. Listen to your favorite energetic or relaxing music. In my case, I love metal and heavy rock music, and sometimes, I hear the music loudly and let go of a lot of negative energy. Apart from enjoying the music, I am relaxing in my way.

Help & Service

Helping someone, even a small act like opening the door for someone, is a great act of kindness. Apart from making better connections, you will start feeling good about yourself. Social service is another way of helping yourself and helping others. Giving back to the community is a great feeling as you are helping those in need, which brings a great sense of productivity and service that will fill you with positive energy and emotions.

To start regulating your emotions well, you need to learn what triggers you into feeling negative emotions and how to evade these events. If you feel the stimulus cannot be evaded, you need to start seeing the stimulus in a different light; when I find challenges in life, I often say that life puts these challenges to me so I can improve as a person with great values.

These are some strategies you can use to manage your emotions. I have used these to improve my life and make it more relaxed while being productive and putting my best efforts into whatever I do. Try applying these strategies to your daily life, and you'll find mental peace and self-improvement that will make you feel great.

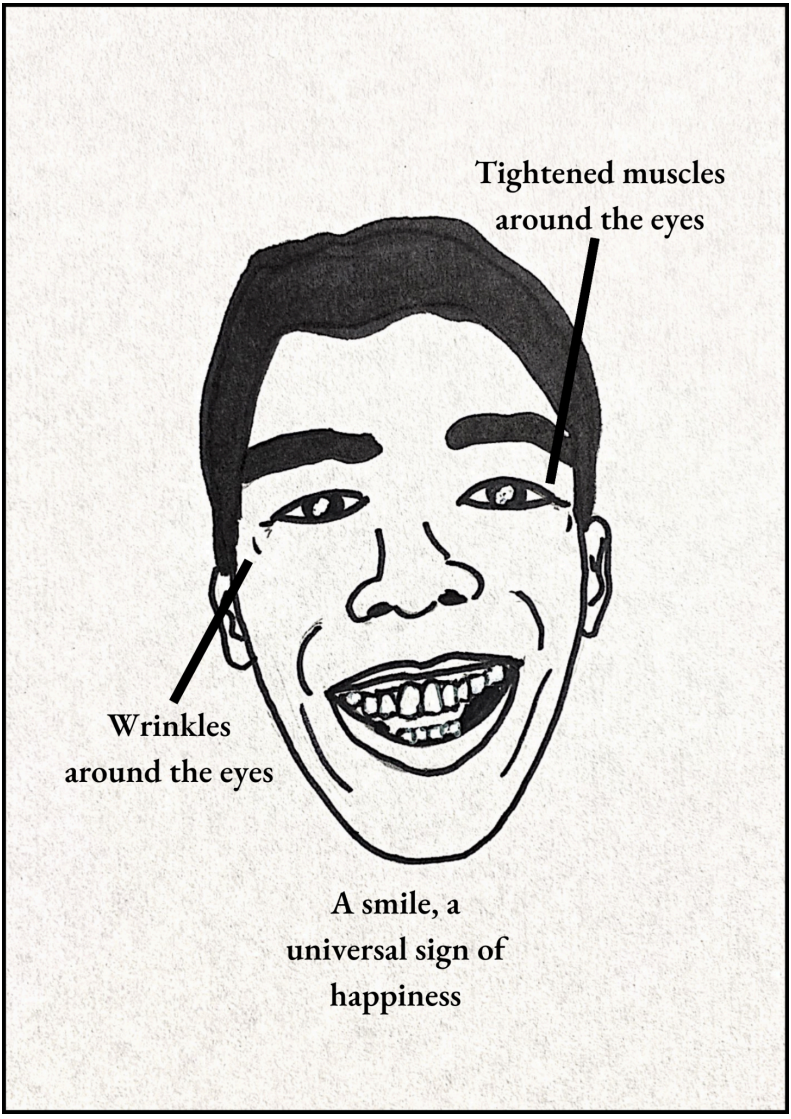
3

The Journey of Happiness

I would consider happiness to be the best emotion of them all. It's such a powerful and beautiful emotion that people would love to be able to be happy all the time. However, as life has joyful moments, it also has complex and bad moments, but remember what we have learned along these pages. It depends on how we confront situations that we can consider bad moments negative or more like opportunities to learn and grow as people.

Happiness involves a series of positive emotions; it is the overall well-being of the organism. The emotion is triggered when a person has good things happening to them; when a person can accomplish a goal, a sense of happiness will run through his body. However, people tend to confuse true happiness with momentary states of joy; one common example is sex. When we talk about achieving true, constant happiness, we need to consider that pleasure acts such as sex are far from that; they are, as mentioned, momentary states of joy in addition to pleasure.

In the brain, happiness is mainly found via neurotransmitters, as many have a function to bring joy and well-being to the body; some of these are dopamine, serotonin, norepinephrine, and endorphins.



The facial expressions of the emotion of happiness. Own elaboration.

Human interactions can bring great moments; we learn through human interactivity, and making relationships can fill us with emotions. The way we face life has a significant impact on what happens to us and the way we respond to challenging situations. Happiness is more than our surroundings; it is our inner self; materialism can't provide happiness alone. We must strive daily to be the best of ourselves; true happiness is not in having but being. Society suffers from confusion where sensations, like body satisfaction, are searched for instead of true happiness. Nothing is wrong with this, but the problem comes when we replace those sensations with truly fulfilling activities and senses. We can't let sensations take over our lives, as we must focus on what is important to us, such as self-growth.

When emotions overwhelm us, we lose the freedom of life, so our objective becomes to regain that life. To do so, we must remember values such as respect, discipline, and perseverance. Our values guide us, and at the end of the day, we will see that happiness acts everywhere we go, in the way we observe and analyze what surrounds us. With resilience, we can find hope to get through hard times; the key to overcoming these difficulties is kindness, love, human interaction, and affectiveness in general.

We must remember that happiness is not an objective but a journey that we need to take advantage of to grow as people and reflect on our lives to realize what we are doing wrong to gain mental maturity and happiness. Find healthy aspects that will benefit our soul and body and get us close to true happiness. Find true happiness, and you'll see a full life after your eyes, full of possibilities and values that will guide you contentedly.

The End

Throughout this book, we have seen how our brain works and how emotions can be found deep inside it. We have also seen how emotions influence our behavior and how overwhelming emotions can negatively affect our health. We were able to learn ways we can deal with those overwhelming emotions so that at the end of it all, we can reach true happiness as a whole life.

Many new advances in the neurobiology of emotions will come with the years with the mission of uncovering the deepest incognitas of emotions in our inner selves. In a world with new generations that have less hope, it is necessary to find healthy ways in which we can feel better about ourselves and improve our interactions and connections with other people from all around the world, leaving hate and prejudices aside, happiness, love, values, and ethics are what will help us on what is to come in the near future.

Acknowledgments

I thank my parents, Edgar and Sandra, for their help and guidance on this beautiful project; without their professional and emotional help, I wouldn't have been able to do this. A special to thanks to my dear Uncle Henry Martinez Beltrán for teaching me the basics on how to write a proper book.

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Sebastián Olave Henao is a 16-year-old student studying in Colegio Colombo Británico. Since a young age, he has shown quite an interest in the human body, and with that, he has viewed his future career in science. With effort and discipline, he has achieved academic recognition at his school, and in the future, he plans to study at a university abroad. He lives in the southern urban area of Cali. *Meet Your Brain and Manage Your Emotions* is his first book.

Humans have developed emotions for survival, but these have become more than just that as they have shaped our behavior, and thanks to them, we are who we are. Many studies have been done about emotions to uncover the anatomic paradoxes and complexity of this subject.

Although emotions are part of our evolution for our survival, they can become overwhelming and cause issues in our inner selves. That is why many strategies exist to manage these negative emotions.

Join me in this journey to understand how our brain works and how emotions originate in our deepest selves. Learn to manage those emotions that bring you down to reach a happy and full life you can enjoy daily.